Implications of digitalization on management control

22E25000 - Accounting for Management Control

Group 9: Lepistö Santeri 361891, Loisa Aki 288301, Luukkonen Annemari 240336, Maakala Samuel 262246
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Definition of management control

In order to study the implications of digitalization on management control, we need to first define what management control is. It is a very wide and loose subject and can be defined in many ways. Basically you need to think how you can get people to do things in a way you want. So the management control is about the dominance and the coordination towards some intentional goal (Hartmann & Vaassen 2003; see Otley & Berry 1980, Ouchi 1979). Lowe (1971) defines the management control system (MCS) as “a system of organizational information seeking and gathering, accountability, and feedback designed to ensure that the enterprise adapts to changes in its substantial environment and that the work behavior of its employees is measured by reference to a set of operational sub-goals (which conform with overall objectives) so that the discrepancy between the two can be reconciled and corrected for”. This traditional view of Lowe refers almost single handedly to the cybernetic control systems (Hartmann & Vaassen 2003). After that, there have been many attempts to construe the framework including other types of controls than just cybernetics. Ouchi’s conceptual control framework has three different control types: market control, clan control and bureaucratic control (Hartmann & Vaassen 2003; see Ouchi 1979). Above all, the clan control mechanism in this framework is different from traditional cybernetic model. One good framework for depicting the controls needed for new economy firms is the Simons’s framework - levers of control (Simons 1995). In his model there is four different controls that help firms to strive towards their strategy in a quickly changing business environment. These levers are (Simons 1995, 7):

1. belief systems, used to inspire and direct the search for new opportunities;
2. boundary systems, used to set limits on opportunity-seeking behavior;
3. diagnostic controls systems, used to motivate, monitor, and reward achievement of specified goals; and
4. interactive control systems, used to stimulate organizational learning and the emergence of new ideas and strategies.

As we can see from the earlier examples of management control system frameworks, there can be many MCS in an organization. Usually they are not introduced simultaneously, or neither coordinated as a single MCS (Malmi & Brown 2008). This is why Malmi and Brown (2008) have introduced a framework that sees the management control systems as a package.
From industrial era to information era

In organizations, deployment of digital technologies have greatly affected how the organizations are managed. In the industrial era power was concentrated to big, centrally controlled corporations that mainly were involved in production activities and they encountered only moderate competition (Hartmann & Vaassen 2003). Traditional concepts of management accounting and control were invented in industrial era and focused on optimization of internal processes by achieving predetermined targets (Hartmann & Vaassen 2003). However, now in the information era organizations face increased competition due to globalization and digitalization, while production is increasingly outsourced to countries with lower wage levels. Markets then again have become more customer-focused as increased competition and advances in technology decrease prices and shrink product life cycles rapidly (Simons 2005). While markets became more customer focused, the managers realized that they had to delegate decision making to front-line employees because they were the ones that were closest to the customer and had the most information about them (Simons 2005). Hartmann and Vaassen (2003) also note how the changes in the economy increased the importance of employee collaboration and learning with each other. Further they argue how the traditional need for control and accounting will continue to be present also in the changed economy, which then posts problem of how much emphasis should organizations put on flexibility and how much on control. Further, how the control could be managed in the way that it encourages the flexibility.

Characteristics of organizations in digitalized environment

In order to examine how digitalization changes management control systems and processes we use conceptual typology that is based on Brown’s (2005) work and is proposed in Malmi and Brown’s (2008) article (Figure 1). The typology is broad in nature and it demonstrates how different controls in MCS work as a package (Malmi & Brown 2008). In the following chapters we discuss the implications of digitalization on each control type of the typology separately. Although these impacts on control systems are sometimes overlapping. We use this typology to facilitate
demonstration of how digitalization and transformation of the competitive environment might change the underlying ways how these controls are used to manage organizations. Discussion is structured in a way that it compares traditional control practices to the new economy control insights while emphasizing especially implications of digitalization on management controls. Although, as the term new economy doesn’t yet have clear meaning or definition it refers here to the fundamental and structural changes in the economy that can be currently observed (Hartmann & Vaassen, 2003). Further, clear characteristic of new economy is that it separates itself from industrial era with increased electronic activities that have significant role in the economic environment.

![Figure 1 Management control systems package (Malmi & Brown 2008)](image)

**Planning as control tool**

Planning can be divided in long-term planning (strategic) and action planning (operational). Planning is used to set out goals and standards needed to be achieved, and also it communicates what is expected from members of the organization (Malmi & Brown 2008). In traditional top-down organization top management makes the strategic plan and conveys it downwards in the organization to middle-management which then reconstructs it to understandable and functional actions that can be carried out and then they convey this downwards to lower-management. This process can be characterized as process where some actors in the organization think while others
do the execution of the plans (Bhimani 2009). According to Malmi and Brown’s (2008) definition of management control systems, the planning as a non-interactive top-down procedure cannot even be considered to be MCS. Planning function becomes a MCS when people are truly part of the planning. This involvement of employees to the planning makes them congruent with the plans and thus willing to execute them (Malmi & Brown 2008).

Kim et al. (2014) analyzed in their study 111 action plan of six German manufacturing plants and how these form their operations strategy. Findings of their study propose that in decentralized organizations relatively more bottom-up plans are adopted than in centralized organizations. Further study found out that when top-down planning and bottom-up learning is used in operations strategy formation, then bottom-up learning impacts on top management’s strategic intentions. Finally, bottom-up action plans tended to bring up diverse improvement opportunities in operational practices that were different from top management’s current strategic focus. This study then implies that bottom-up action plans can impact on top management strategic intentions and that these bottom-up plans can be valuable for the organization as they contain unique information about how to improve operational practices from the viewpoint of the employees. Finally, decentralization is found to be a factor that increases adaptation of bottom-up plans.

Digital economy, due to its nature of rapid and unpredictable change posts pressure to the traditional planning processes and whether they are sufficient. In new economy firms the notion is that knowledge is in the heads of the organization’s employees and not in the organization’s processes itself (Hartmann & Vaassen 2003). Employees at the lower levels of the organizations which are closest to the customers then have valuable information about the customers and their changing needs. Hartmann and Vaassen (2003) argue that in the changing environment empowered employees should have more discretion and power to adjust their actions in accordance to changing situations. They further point out how control shifts in the organizations from controlling processes to controlling empowered persons. The changing nature of the environment and increased importance of customer orientation in the digitalized world then positions lower-level employees in critical role in the organization. Organizations competing in changing environment should exert type of control that is not about achieving predetermined plan, but to realize organizations potential (Hartmann & Vaassen 2003). Bhimani and Bromwich (2009) are pondering that in the digitized enterprises planning procedure is not linear anymore.
They claim that in a modern company, people are acting at the same time when they are doing plans.

**Cybernetic controls**

Malmi & Brown (2008) typology consists of four cybernetic control systems: budgets, financial measures, non-financial measures; and hybrids (for example Balanced Scorecard). The cybernetic control process can be defined so that first, predetermined standard is set, then actual performance is measured and if the actual performance differs from the preset standard, then corrective measures are determined and directed by control unit, and finally these corrective measures are communicated to the company (Hartmann & Vaassen 2003; see Anthony 1981, 8). However, cybernetic model is not management control system until it links behavior to targets and makes employees accountable for variations in performance (Malmi & Brown 2008).

There has been a lot of criticism towards traditional budgeting (e.g. Hope & Frazer 2003). In practice it could be quite difficult to abandon budgeting since it is so central element in many firms. As Malmi and Brown’s (2008) framework shows, planning, and reward and compensation systems are often linked to the cybernetic functions. Of course this does not only mean budgeting. But at least financial measurement systems or non-financial measurement systems are needed to be able to use for example reward systems.

In new economy cybernetic model can be extended so that it becomes more adaptive, by adding more complex sensors to find out increasingly detailed information about the environment and processes that make actual performance deviate, additionally increasing organization’s proactive capabilities to react to the deviations and make decisions (Hartmann & Vaassen 2003). Authors further explain that for example strategic BSC can be thought as extended model of cybernetic model if operational measures are causally linked with financial measures. Extended cybernetic model moves away from fixed standards and acknowledges that organization should have wider goals set than short-term targets (Hartmann & Vaassen 2003).
Reward systems

Malmi and Brown (2008) remark how reward and compensation is often linked to cybernetic controls. In new economy it is increasingly important to plan compensation plan in a way that these systems encourage and direct employees act in a way that is aligned with the company’s strategy. "You get what you measure" applies also here. For example if incentives are based on predetermined subjective short-term performance targets they make employees to focus on achieving these short-term targets rather than search for new opportunities that are aligned with organization’s mission (Hartmann & Vaassen 2003).

Digitalization makes gathering of performance measurement information easier. Technology has made possible to even measure employees performance on minute level in certain jobs (Andon et al. 2003), therefore making it possible to use performance measurement system as surveillance system. Technology advances and digitalization have thus made measures increasingly accurate and also increased the amount of measures that managers can choose from when designing compensation systems. However, in our opinion above improvements do not necessarily mean that reward and compensation systems would be now somehow easier to structure. Then again, as that reward systems can be designed in a way that it is congruent with organizations cultural aspects, it is possible to use them to strengthen cultural control aspects. Reward system in digitalization context also could work as a control system aimed to retain organization’s valuable knowledge-workers.

Administrative Controls

Following Malmi and Brown’s (2008) typology, administrative controls include organizational design & structure, the governance structures and the procedures and policies. As the new economy will demand more agile structures, the organizational structure might lose its value as a control mechanism. This is due to a demand for decentralized structure. The traditional bureaucratic form of the companies may be replaced by networks (Bhimani 2003; see Kauffman & Walden 2001; Stalder 2002). The decentralization is followed by the need of empowerment of the lower level employees. This again means that the governance structure does not anymore play so important role as a control mechanism. Vice versa, these changes demand policies and procedures
to be well defined so that they ensure that the empowered individuals does not destroy value. In a way policies and procedures can act like boundaries.

Mark McDonald (2015), managing director at Accenture, gives an interesting example about how the digitization could affect on the organizational structure. As a consequence of digitalization middle managers are required to move from being in the middle of a hierarchy, managing a fixed team of people and activities to the middle of a network managing flexible resources to achieve customer and company outcomes. Digital technology features should lead to an organization where middle management is replaced with performance transparency, social coordination, purpose driven cultures, meritocracy and democratized decision-making. In other words, this requires middle managers to move from being administrators to leaders.

The boundaries of organizations has also become more wavering and transparent. Globalization and digital economy have changed the traditional industrial value chains where products were manufactured within the company, to value chains where products are co-conceived and co-produced by companies, their suppliers and their customers (Bhimani & Bromwich 2009).

**Cultural controls**

Cultural controls might be the type of controls that the digitalization has had the least impact on. Nevertheless these can be an important way of control in the new economy firm. As we have earlier described, in order to succeed the new economy firms might need to apply more decentralized structures. This empowerment of the workforce can of course cause some risks that people might do something which is not aligned with the firm’s strategy. We claim that cultural controls are good way to control people's acts with very subtle way. They do not restrain people’s innovativeness, but they act as invisible boundaries, and thus guide actions towards the strategic goals.

Hartmann and Vaassen (2003) state that the outcome of knowledge workers’ high potential is making them more mobile, meaning that they can change their workplace more easily. Even though the mobility of the workforce is not necessarily a bad thing, we think that the cultural controls might be a solution, when company tries to keep its best employees in the company. Accurately defined values, symbols and a good spirit could be an important bait for an employee
to stay in the same company longer. If the worker shares the same values with the company it is unlikely that he/she would want to change company for one that does not share the same values. Usually one would think that people are willing to leave a big company easier than a little company where you are part of the “family”. However, in our opinion the clan can be one’s “family” also in the bigger company. Another aspect of cultural controls is the hiring function. In new economy organization should prefer hiring people that share the same organizational values than they do as these values can be determining factor why certain person would choose to stay in the company. Another aspect to be considered is that if organization’s structure is decentralized, then should the organization hire people that gravitate toward self-organizing and independent behavior (see Hartmann & Vaassen 2003).

After discussing the general implications of digitalization on the management control systems, we move to examine the effects of Enterprise Systems (ES) and Enterprise Resource Planning (ERP) systems on the management control.

**Use of Enterprise Systems as support of Management Control**

The concept of Enterprise System (ES) has a strong connection with Enterprise Resource Planning System (ERP system). Basically ERP system is part of ES and occasionally these terms are overlapped in some research articles covering the subject (e.g. Rikhardsson, Rohde & Rom 2005; Granlund 2011). ES have had a major impact on business organizations in the past years as they support and standardize business processes, integrate data and influence management activities such as planning and control. However, existing management control frameworks have been criticized for not recognizing the significance of information, communication and risk control in today’s operating environment (Rikhardsson et al. 2005). Further Rikhardsson et al. (2005) have argued that existing management control frameworks are not well suited at describing the relationship between ES and management control of contemporary organizations.

First of all, in today's information society there is an increased importance of information and communication as control variables. The importance of issues like controlling information quality, reliability of communication processes, and controlling access and use of information has grown significantly (Rikhardsson et al. 2005). Also, reliable and relevant information becomes more and
more important for decision making in fast changing business environments. Secondly, existing conceptual frameworks do not adequately reflect current trends within management control practice. There is an increased focus on enterprise risk management (ERM), compliance with management control guidelines such as COSO (Committee of Sponsoring Organizations), COBIT (Control Objectives for Information and related Technology) and legislation affecting management control such as the Sarbanes-Oxley Act. (Rikhardsson et al. 2005.)

Schermann, Wiesche and Krcmarhe (2012) have also studied the role of information systems (IS) in helping organizations to address the challenge of achieving a trade-off between exploitative and exploratory management control activities. As exploitative activities focus on efficiency and reducing deviations in performance and include standardization, refinement, and establishment of routines, exploratory activities on the other hand focus on innovation and include experimentation, risk taking, and search. Schermann et al. (2012) have noted that an important aspect of management control activities is the nature of the information systems that support them and finding a balance between exploitative and exploratory management control activities. In management control research, the tension between the exploitative and exploratory activities has been explored in relation to Simons’ (1995) levers of control framework.

As mentioned, last decades have brought major changes to information technology (IT), which in turn has had an impact on the relationship between IT and management control. Today, virtually every major business has implemented one or more ERP systems. IT plays a critical role in modern business, and further in accounting and management control. Thus, if information systems are not in order in the contemporary business environment, management control processes will not work properly (Granlund 2007). In addition, the academic understanding of management control has recently expanded seeing control as a management system aimed at assessing, minimizing and controlling business risk associated with company business processes, business transactions, information technology applications and information dissemination to internal and external decision makers (COBIT 2004; COSO 2004).

Therefore, understanding the relationship between management control and ES is important as a part of a broader process focusing on the effects of information technology on organizational behavior in general but also more specifically regarding the effects on a specific information technology on planning and decision processes and management practices (Rikhardsson et al. 2005). ES is a contingent factor impacting management control practices as it seems to affect the
role of accounting in management control. Additionally, Dechow and Mouritsen (2005) have also noted that the integration of management and control can be pursued through ERP systems. Furthermore, ERP systems not only provide decision makers with traditional financial metrics, but are capable of capturing and delivering non-financial performance indicators (NFPI) as well (Dechow and Mouritsen 2005).

**Use of Enterprise Resource Planning system on Management Control**

Dechow and Mouritsen (2005) define ERP systems in their article: “ERPSs are organization-wide and integrated information systems that can be used to manage and coordinate all the resources, information, and functions of a business from shared data stores. As ERPSs are intended to integrate all corporate information into one central database, they allow all information to be retrieved from many different organizational positions and to make any organization object visible”. In our opinion enterprise resource planning systems have been one of the most significant implications of digitalization from the view of management control.

The wide introduction of ERP systems has a remarkable effect on companies’ management control. As Granlund and Mouritsen (2003) have stated: “The recent interest in ERP systems has re-opened the issue of information technology because it promises to be a platform for the management of the whole business rather than merely about the management of certain parts of the business.” Another description about ERP systems define that they “are embedded by the promise of integration that standardizes operations and thereby enables their centralized management.” (Teittinen, Pellinen & Järvenpää 2013). These statements describe well the huge significance ERP systems have on management control. Additionally, another significant feature of ERP systems is their ability to provide easy and fast access to relevant and real-time operational data needed in decision-making and management control (Kallunki, Laitinen & Silvola 2011). Kallunki et al. (2011) say that the main purpose of management control systems is to monitor decisions all over the organization and to steer employee behavior in desirable ways in order to improve the organization’s ability to achieve its objectives, including organizational performance.
As we have above mentioned ERP systems provide easily real-time data from operations of company. Thereby the introduction of ERP system creates possibilities to implement new management control systems or improve existing ones.

One interesting question relating to this topic posed in Granlund and Mouritsen’s (2003) article: “How precisely technology drives management control logic, and how management control problems drive information technology solutions”. Good example for this kind of driving effect is activity-based costing (ABC) which is not possible to implement without high amount of intra-organizational information. (Granlund & Mouritsen 2003). So increased use of different kind of information systems may have been the driving factor of inventing the activity-based costing method. Through activity-based costing organization is able to allocate costs more accurately and more equitable for every business units. This permits the use of business level metrics as a target-setting for example via balanced scorecard. If the costs are not allocated (even closely) according to cause-effect link there is no idea to set precise targets to business unit level. Consequently we argue that many management control systems would not be very useful without the digitalization and its implications.

As we demonstrated in previous paragraph, digitalization makes possible the creation of new management control or accounting systems. Thanks to ERP systems’ feature to provide real time and relevant data about business operations, it may enable the more efficient use of some tools of management control systems. In Granlund and Malmi’s multi-organization field study, including ten large companies who have adopted ERP system, one company said that ERP system enabled them to use rolling forecasting globally (Granlund & Malmi 2002). On the contrary most of the companies (6 out of 10) in this study had budgeting in a separate system of ERP system. The same logic was found in the use of activity-based costing. Eight of ten companies applied ABC at least in some parts of their organization but only one of these companies exploited ERP system in ABC. Other companies had own system for ABC. (Granlund & Malmi 2002.) We experience this low exploitation of ERP systems for management control systems quite surprising. The reasons for this kind of results in Granlund and Malmi’s study were found that current ERP systems were too complexity to applicate to ABC. It was also proposed that more sophisticated system including ABC may be built later. (Granlund & Malmi 2002.)
Different roles of ERP systems

Despite of the ERP systems’ revolutionary role in collecting, storing, disseminating and using of business data, the existing research have provided only few findings about the implications of ERP systems’ introductions have to management control. Still ERP systems constitute the main technological infrastructure for accounting systems as well as management control systems. (Teittinen et al. 2013.) In the study of Hopper and Quatrone (2003) an American multinational company even saw their ERP system as a global, common and simple management control system. On the other hand in some cases ERP systems are just for automating and standardizing conventional management control systems. Thus there is no any direct relation between implantation of ERP system, greater information and better control. (Hopper & Quatrone 2003.) One opinion about the role of ERP systems regarding management control is that ERP systems are like change agents which drive changes in management accounting practices directly and indirectly. Direct effects concern things like content and form of reports. The implementation of ERP system is often incorporated with a business process development program like business process re-engineering. Indirect effects of ERP systems occur via changes in management practices and business processes. (Granlund & Malmi 2002.)

The benefits of ERP systems

Teittinen et al. (2013) have created the chart below about the benefits and the challenges of ERP systems relating their case-study. As it’s possible to see the benefits relate to the ERP systems’ ability to control different things. The chart describes well how these two duties of ERP systems are related to management control via strategic control by ERP systems and operational control by ERP systems. The role of management control is to tackle to the problems arose from the ERP systems. (Teittinen et al. 2013.)

Dechow and Mouritsen (2005) have conducted a cross-case-comparison about two big multinational organizations who had implemented ERP system. They found that both of their case companies had experienced that ERP system helped the companies towards improved financial accounting and towards more precision and timeliness, because of automatic data reconciliation conducted via ERP system. Moreover the top management of the case study in Teittinen et al.
(2013.) found ERP system had increased transparency and thereby facilitate the managing of subsidiaries.

Challenges of ERP systems

In the chart of Teittinen et al. (2013) the challenges of ERP systems are divided in two categories: problems relating people and those relating technology. In the study conducted by Teittinen et al. (2013), it was found that people inputting the data into ERP system are in the crucial role in the usability of ERP system for management control purposes. In the same study it was found that mistakes and errors decreased the value of ERP system as a tool management control. Mistakes and errors were mainly due to the lack of computer skills. (Teittinen et al. 2013.)

There is lot of evidence about the challenges of ERP systems’ implementations. Sometimes the implementation of ERP system have even paralyzed the operations of the whole company. Furthermore the promises of integration and other benefits may not be realized as predicted. (Teittinen et al. 2013.) Modern ERP systems are often very complex systems so implementation in not at all unambiguous (Teittinen et al. 2013). It has been found that implementation process produces unexpected developments and the end point may be far away from initial expectations (Hopper & Quatrone 2003). It was found that despite of ERP systems usually cause integration it
can also lead disintegration in some part: in the case study of Teittinen et al. (2013) ERP system increased the disintegration between long-term strategic control and short-term operative control.

The implementation of ERP systems cause inflexible structures which is not a positive issue for management control. Making changes in ERP systems after the implementation has been found very difficult in many companies. It is quite big problem for management control that companies have challenges to model the changes in the production and business environment to their ERP systems. (Teittinen et al. 2013; Granlund & Malmi 2002.) In the study of Dechow and Mouritsen (2005) SAP (common ERP system) turned out to be a restrictive factor towards many kids of management control in both case companies. Therefore, it is very important to have clear vision about what company wants from ERP system before configuring it.

ERP systems have both benefits and challenges as well as enabling and restrictive effects on management control but it’s not only about the systems themselves. It is also very crucial how management mitigate implementation problems with new and innovative ways of using new data for management control. (Granlund 2011.) There is not any comprehensive study about the implications of the usage of ERP system on management control from the last years. In our opinion the best approach would be cross-sectional field study as Granlund and Malmi have conducted (2002). Their research design was very good but we believe the findings could be quite different because ERP system is not anymore the “new thing” and companies have probably implemented and exploit their ERP systems better than in 2002. On the other hand ERP systems may be more sophisticated nowadays.

Conclusions

In our paper we have discussed how the digitalization changes the business environment to be more dynamic and ever-changing. This reflects to the organization structures. There will be need for the more decentralized structures. Decentralization requires stronger employee empowerment. All these changes in the “new economy” will mold the weights of different components in the management control systems package. We think that cultural controls might become more important management controls in the future. Cultural controls act as subtle and
broad boundaries in which employees can operate innovatively and independently towards organization’s high level objectives.

Traditionally cybernetic controls have been very popular. In rapidly changing new economy cybernetic controls will have new forms as the traditional budgeting for example is claimed to be too rigid model. We argue that cybernetic controls should be made more flexible and agile so that their usage in new economy would be more useful. Nevertheless the cybernetic controls cannot be abandoned totally because they are closely integrated to the planning and reward and compensation controls. At least there should be financial measurement and non-financial measurement systems to provide information for the planning and compensation purposes.

In our opinion planning should also experience decentralization as people in lower levels could also have valuable insights. Involving more parts of organization to the planning could create more quality action plans as the lower level employees has the best operational knowledge. In addition the bottom-up plans can also mold the upper level’s strategic intentions. Also, we think that digitalization doesn’t have such great impact towards reward and compensation controls. Of course digitalization has increased the number of ways to construct the compensation systems due to a large amount of easily gatherable data. However the main issues how to construct a good compensation system stays the same.

In our opinion, administrative controls may encounter the biggest change. The weights between administrative controls group likely shifts from governance structure and organization structure to policies and procedures. As the governance and organizational structures will lose their significance due to a decentralization and the employee empowerment, the policies and procedures will have a very important role in ensuring that the action of employees is going to a right direction and doesn’t destroy the value of the company.

Granlund and Mouritsen (2003) conclude that IT enables the running of modern accounting and management control and we totally agree with this. It would be impossible to think any company (employing more than few employees) operating without IT systems for accounting or management control. In addition, the importance of information and communication as control variables is likely to increase even more.

The integration of management and control can be pursued through ERP systems and in our opinion these systems have been one of the most significant implications of digitalization from the
view of management control. ERP systems can be viewed as a platform for the management of the whole business since they standardize operations and thereby enable their centralized management. This describes well the significance that ERP systems have on management control. Also, their ability to deliver relevant and real-time data is crucial for decision making in today’s fast changing business environment.

However, Granlund and Malmi (2002) found that ERP systems are not very widely exploited for management control tools like budgeting. The finding was pretty surprising because of the ERP systems many-sided nature. On the other hand there is not any comprehensive study about the implications of the usage of ERP system on management control from the last years. Consequently the situations may have changed. Altogether ERP systems have had a huge impact on management control and the significance of these systems will definitely not at least decrease.
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